

REMARKS

The above amendment is made in response to the Office Action of February 26, 2003. Applicant has enclosed herewith a copy of the marked-up version of the amended claims as required by 37 C.F.R. §1.121. The Examiner's reconsideration is respectfully requested in view of the above amendment and the following remarks.

Claims 3, 15 and 16 have been canceled, without prejudice. Claims 1, 2, 6-9 and 13 have been amended. Claims 1, 2, 6-14 and 17-19 are pending in the present application.

Rejections Under 35 U.S.C. §112, second paragraph

Claims 8, 9 and 13-16 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Examiner has stated that claims 8, 9, 13, 15 and 16 recite method limitations while being dependent upon an apparatus claim, and that claim 14 has insufficient antecedent basis for the limitation "the inert gas."

With respect to claims 8, 9 and 13, it is respectfully submitted that no method limitation is recited in claims 8, 9 and 13. Applicant has amended claim 8, 9 and 10 only to further clarify the claimed subject matters. Amended claims 8, 9 and 13 have no method or functional limitations, but clearly define the characteristics of the first and second flow rates of the first and second ozone flows and the temperature of the heat, respectively. Thus, it is submitted that claims 8, 9 and 13 particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

With respect to claim 14, Applicant submits that claim 14 depends from claim 1 where an antecedent of the limitation "the inert gas" exists. That is, claim 1 recites in line 4 an inert gas supply unit for providing "inert gas" to the reactor. Thus, the limitation "the inert gas" in claim 14 has the proper antecedent basis in claim 1.

With respect to claims 15 and 16, Applicant has canceled claims 15 and 16, without prejudice.

Accordingly, Applicant respectfully requests that the rejections under 35 U.S.C. 112, second paragraph, be withdrawn.

Rejections on claims 1, 2 and 14-16 Under 35 U.S.C. §103(a)

Claims 1, 2 and 14-16 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Horie (U.S. Patent No. 5,928,428) in view of Tanaka (U.S. Patent No. 5,091,207) and further in view of Nozawa et al. (U.S. Patent No. 5,290,381; hereinafter "Nozawa"). The Examiner has stated that Horie in combination with Tanaka discloses all elements and means of the claimed invention.

Claims 15 and 16 have been canceled, without prejudice. Claim 1 has been amended to recite, *inter alia*, a first mass flow controller connected to an ozone generator for providing a first ozone flow to a reactor at a first flow rate and a second mass flow controller connected to the ozone generator for providing a second ozone flow to the reactor at a second flow rate, where the first and second mass flow controllers are connected parallel to each other between the ozone generator and the reactor. In other words, in the claimed invention, the first and second mass flow controllers are connected in parallel to the same ozone generator, and the ozone is provided to the reactor in such a manner that the first ozone flow is provided at the first flow rate from the first mass flow controller and the second ozone flow is provided at the second flow rate from the second mass flow controller. Further, amended claim 1 recites, *inter alia*, first and second ozone transfer units such that one of the first and second mass flow controllers provides corresponding one of the first and second ozone flows to the reactor at a time.

Horie is directed to an apparatus for forming silicon oxide films on a wafer in manufacturing semiconductor devices. In Horie, oxygen-based gas is provided to a chamber merely to accelerate oxidation of TEOS gas which is deposited in an exhaust vacuum pipe, so as to reduce the amount of particles being deposited on the wafer. See col. 6, lines 9-19. Horie does not teach or suggest first and second mass flow controllers that are connected in parallel to a same ozone generator, as claimed in amended claim 1. Further, there is no disclosure or suggestion in Horie of any features such that first and second mass flow controllers provide first and second ozone flows at first and second flow rates, respectively, to a reactor, as claimed in claim 1. Further more, Horie does not teach or suggest anything about first and second mass flow controllers one of which provides corresponding one of the first and second ozone flows to the reactor at a time, as claimed in claim 1.

Tanaka is directed to an apparatus for chemical vapor deposition (CVD) process in manufacturing semiconductor devices. Tanaka merely discloses a CVD apparatus for

providing a reaction furnace with a gas flow having improved uniformity. In Tanaka, there is no disclosure or suggestion of first and second mass flow controllers that are connected in parallel to a same ozone generator, as claimed in amended claim 1.

Nozawa merely discloses a plasma etching apparatus for manufacturing semiconductor devices, which has a cooling mechanism for protecting semiconductor wafers from heat during an etching process. Nozawa does not teach or suggest anything about first and second mass flow controllers that are connected in parallel to a same ozone generator, as claimed in claim 1.

Thus, Applicant submits that Horie, Tanaka and Nozawa, either alone or in combination, do not render obvious the subject matter of claim 1. Claims 2 and 14 depend directly or indirectly from independent claim 1, thus include all the limitations of claim 1.

Accordingly, it is believed that claims 2 and 14 are allowable due to their dependency on claim 1 which is believed to be allowable for at least the reasons stated. Reconsideration of the rejections on claims 1, 2 and 14-16 is respectfully requested.

Rejections on claims 3, 6-10, 12, 13, 17 and 18 Under 35 U.S.C. §103(a)

Claims 3, 6-10, 12, 13, 17 and 18 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Tanaka and further in view of Nozawa and Limb et al. (U.S. Patent No. 5,352,615; hereinafter "Limb"). The Examiner has stated that all elements and means of the claimed invention are disclosed by the cited references.

Claim 3 has been canceled, without prejudice. Claim 1 has been amended to recite, *inter alia*, a first mass flow controller connected to an ozone generator for providing a first ozone flow to a reactor at a first flow rate and a second mass flow controller connected to the ozone generator for providing a second ozone flow to the reactor at a second flow rate, where the first and second mass flow controllers are connected parallel to each other between the ozone generator and the reactor.

As mentioned above, Horie, Tanaka and Nozawa, either alone or in combination, do not teach or suggest the first and second mass flow controllers connected in parallel to a same ozone generator, as claimed in claim 1.

Limb is directed to an apparatus for denuding a semiconductor substrate. Limb discloses gas lines for CO, CO₂ and inert gas flow. The CO, CO₂ and inert gas lines in Limb are merely for providing a furnace tube with a "mixture" of CO and CO₂ gases or the

inert gas. *See* col. 2, lines 41-56 and col. 3, lines 9-18. Limb neither discloses nor suggests first and second mass flow controllers connected in parallel to a same ozone generator, for providing a reactor with first and second ozone flows at first and second flow rates, respectively, as claimed in claim 1. Further, there is no teaching or suggestion in Limb of first and second mass flow controllers one of which provides corresponding one of the first and second ozone flows to the reactor at a time, as claimed in claim 1.

Accordingly, claim 1 is believed to be patentably distinct and non-obvious in view of Horie, Tanaka, Nozawa and/or Limb. Claims 6-10, 12, 13, 17 and 18 depend directly or indirectly from claim 1, thus include all the limitations of claim 1. It is thus believed that claims 6-10, 12, 13, 17 and 18 are allowable for at least the reasons given above for the independent claim 1. The Examiner's reconsideration of the rejections on claims 3, 6-10, 12, 13, 17 and 18 is respectfully requested.

Rejections on 11 and 19 Under 35 U.S.C. §103(a)

Claims 11 and 19 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Tanaka, Nozawa and Limb and further in view of Nishikawa et al. (U.S. Patent No. 5,470,390; hereinafter "Nishikawa"). The Examiner has stated that all elements and means of the claimed invention are disclosed by the cited references.

As mentioned above, Horie, Tanaka, Nozawa and Limb, either alone or in combination, do not teach or suggest the first and second mass flow controllers connected in parallel to a same ozone generator, for providing the first and second ozone flows at the first and second flow rates, respectively, to the reactor, as claimed in claim 1.

Nishikawa merely discloses an apparatus for supplying a mixture of different gases to a plurality of semiconductor manufacturing units. *See* col. 2, lines 15-29 and col. 3, lines 62-67. Nishikawa neither teaches nor suggest the first and second mass flow controllers connected in parallel to a same ozone generator, for providing the first and second ozone flows at the first and second flow rates, respectively, to the reactor, as claimed in claim 1.

Thus, it is respectfully submitted that Horie, Tanaka, Nozawa, Limb and Nishikawa, either alone or in combination, do not disclose or suggest the first and second mass flow controllers connected in parallel to a same ozone generator, as claimed in amended claim 1.

Claims 11 and 19 depend indirectly from claim 1, thus includes all the limitations of claim 1. Accordingly, it is believed that claims 11 and 19 are allowable for at least the

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reasons given above for the independent claim 1. The Examiner's reconsideration of the rejections on claims 11 and 19 is respectfully requested.

Conclusion

In light of the above discussion, the subject matters of amended claim 1 include limitations, for example, the first and second mass flow controllers connected in parallel to the same ozone generator, that are neither taught nor suggested by any, either alone or in combination, of the cited references. It is thus believed that all the claims now pending in the application are in condition for allowance.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the outstanding rejections. If there are any charges due with respect to this response, please charge them to Deposit Account No. 06-1130 maintained by Applicant's Attorneys.

The Examiner is invited to contact Applicant's Attorneys at the below-listed telephone number with any questions or comments regarding this Response or otherwise concerning the present application.

Respectfully submitted,

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MARKED-UP VERSION OF AMENDMENTS**CLAIM AMENDMENTS**

Please amend claims 1, 2, 6-9 and 13 as follows:

1. (Three Times Amended) A semiconductor thin film deposition apparatus comprising:

a reactor in which a wafer is received;

a reaction gas supply unit for providing reaction gas to the reactor;

an inert gas supply unit for providing inert gas to the reactor;

an exhaust pump for exhausting gas from the reactor;

an ozone generator for generating ozone to react with the reaction gas;

a first ozone transfer unit having a first mass flow controller connected to the ozone generator, for receiving the ozone from the ozone generator to provide the reactor with a first ozone [to be used] flow at a first flow rate for a thin film deposition on the wafer, wherein the first ozone flow and the reaction gas are provided into the reactor at respective times different from each other;

a second ozone transfer unit having a second mass flow controller connected to the ozone generator, for receiving the ozone from the ozone generator to provide the reactor with a second ozone flow at a second flow rate for a thermal treatment on the wafer, the first and second mass flow controllers being connected parallel to each other between the ozone generator and the reactor, wherein one of the first and second mass flow controllers provides corresponding one of the first and second ozone flows to the reactor at a time;

an ozone control unit connected to the ozone generator in parallel with the first and second ozone transfer [unit] units, for receiving the ozone from the ozone generator to allow a certain amount of ozone to flow to the first and second ozone transfer [unit] units by removing an excessive amount of ozone generated by the ozone generator;

a first selection valve connected between the first and second ozone transfer [unit] units and the reactor, for controlling [a] the first or second ozone flow [of the ozone] from the first or second ozone transfer unit to the reactor; and

a second selection valve connected between the first and second ozone transfer [unit] units and the exhaust pump, for controlling [a] the first or second ozone flow [of the ozone]

from the first or second ozone transfer unit to the exhaust pump, wherein the first and second selection valves perform opposite operations at a same time.

2. (Three Times Amended) The semiconductor thin film deposition apparatus of claim 1, further comprising a main valve disposed between the ozone generator and the first and second ozone transfer [unit] units, for controlling a flow of the ozone from the ozone generator to the first and second ozone transfer [unit] units.

6. (Twice Amended) The semiconductor thin film deposition apparatus of claim [3] 2, wherein the first ozone transfer unit further comprises:

a first ozone transfer valve having an inlet connected to an outlet of the main valve of which inlet is connected to an outlet of the ozone generator, and an outlet connected to an inlet of the first mass flow controller;

[a first mass flow controller having an inlet connected to an outlet of the first ozone transfer valve, for controlling a flow rate of the ozone to be used for the thin film deposition on the wafer;] and

a second ozone transfer valve having an inlet connected to an outlet of the first mass flow controller and an outlet generating the first ozone [to be used for the thin film deposition] flow to the first and second selection valves.

7. (Twice Amended) The semiconductor thin film deposition apparatus of claim 6, wherein the second ozone transfer unit further comprises:

a third ozone transfer valve having an inlet connected to the outlet of the main valve to which the inlet of the first ozone transfer valve is connected, and an outlet connected to an inlet of the second mass flow controller;

[a second mass flow controller having an inlet connected to an outlet of the third ozone transfer valve, for controlling a flow rate of the ozone to be used for the thermal treatment on the wafer;] and

a fourth ozone transfer valve having an inlet connected to an outlet of the second mass flow controller and an outlet generating the first ozone flow [to be used for the thermal treatment] to the first and second selection valves.

8. (Twice Amended) The semiconductor thin film deposition apparatus of claim [7] 1, wherein [the first mass flow controller controls] the first flow rate of the first ozone flow [to be used for the thin film deposition] is in a range from about 100 sccm to about 500 sccm.

9. (Twice Amended) The semiconductor thin film deposition apparatus of claim 8, wherein [the second mass flow controller controls] the second flow rate of the second ozone flow [to be used for the thermal treatment] is in a range from about 100 sccm to about 20000 sccm.

13. (Twice Amended) The semiconductor thin film deposition apparatus of claim 12, wherein [the heater provides] the heat [at] has a temperature in a range from about 300 °C to about 700 °C.